

# VOC Emission Calculation Methodology for Lithographic Printing Operations – December 2011

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The following methodology should be used to calculate VOC emissions from lithographic printing operations. This methodology has been developed by the District in cooperation with the Printing Industries Association.

## Lithographic Inks

$$\text{Emissions} = Q * [ \text{VOC} * (1 - \text{RF}) ] * (1 - \text{C}_{\text{OVERALL}}) \quad \text{Eq. (1)}$$

where:

- Emissions = Emissions of volatile organic compounds (lbs)
- Q = Quantity of ink applied (lbs)
- VOC <sup>(1)</sup> = Volatile Organic content (weight fraction or lb/lb) of ink
- RF <sup>(2)</sup> = Retention factor for the lithographic oil content in inks (decimal)
- C<sub>OVERALL</sub> <sup>(3)</sup> = Control System Overall Efficiency (decimal)

- (1) User may refer to the product Material Safety Data Sheet (MSDS) to determine the volatile organic compounds (VOC) content of the ink. This may include, but not limit to, one or more of the following:

- Volatile organic compounds (VOC)
- Lithographic oil content (LOC) such as:
  - Petroleum-based oils
  - Vegetable-based oils
  - Oxidizing oils
  - Middle distillates
  - Linseed oil
  - White mineral oil
  - Other oils

If MSDS provides both VOC and LOC percentages or fractions, use the higher number for calculation purposes. **NOTE:** Unit of VOC must be consistent with that of ink applied (Q), i.e., VOC in weight fraction of lb/lb for Q in pounds.

- (2) Depending on type of inks, the following retention factors are applicable for equation (1):

**HEATSET INKS:                      RF = 0.20**

**NON-HEATSET INKS:              RF = 0.95**

- (3) Overall efficiency ( $C_{\text{OVERALL}}$ ) of a control system is defined as:

$C_{\text{OVERALL}} = C_{\text{CAP}} \times C_{\text{DES}}$	Eq. (2)
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where:

$C_{\text{CAP}}$  = Capture Efficiency of Control System (fraction)

$C_{\text{DES}}$  = Destruction Efficiency of Control Equipment (fraction)

In general, control system performance is tested to determine these efficiencies. In the absence of specific source test results, a default capture efficiency of 99.5% ( $CP = 0.995$ ) is allowed for **heatset inks only**. Any deviation from this default value must be substantiated with supporting documentation.

## **HOW TO REPORT**

- From the drop lists, select or provide **Material and Device Description, Material Code, and Activity Code**.
- **Annual Material Usage:** Enter total quantity of lithographic inks used ( $Q$  in **pounds**) during the reporting period. If needed, convert  $Q$  from gallons to pounds by multiplying  $Q$  (in gallons) by the ink density (lb/gal).
- **Units:** From drop list – Select **pound**
- **Rule Number:** Enter **1130**
- **Application Numbers:** Enter applicable permit application number/s.
- **TAC / ODC:** Put check mark **ONLY IF** material contains TAC/ODC.
- **Overall Control Efficiency:** Use equation (2) above to determine the Overall Control Efficiency and enter **in decimal** number. Enter zero (0.00) if Form B3U is used.
- **Emission Factor:**
  - ❖ If using default emission factor, check the box marked “Use Default Emission Factors”. Default emission factors for lithographic inks are available in **HELP and SUPPORT** (under Forms and Factors)
  - ❖ The non-default emission factor can be determined as follows:
    - **VOC:** From ink MSDS, find organic content based on VOC or lithographic oil content (LOC) in weight fraction or lb/lb. If MSDS provides both VOC and LOC

percentages or fractions, use the higher number. If VOC is given in lb/gal, then convert VOC from lb/gal to lb/lb by dividing VOC (lb/gal) by the ink density (lb/gal).

- Determine the applicable retention factor, **RF** (RF = 0.95 for non-heatset inks or RF = 0.20 for heatset inks).
- Emission Factor = [VOC \* (1 – RF)]
- Enter the calculated emission factor and click “**ADD RECORDS**” to save your entries.

## **Assumptions for Other Lithographic Printing Ink Operations**

**Fountain solutions and blanket/roller washes** do not possess the same characteristics as lithographic inks; therefore, retention factors are not applicable to emissions from the use of these materials. However, in the absence of a specific source test, a carry-over factor is allowed as follows:

- ◆ 70% of emissions from **fountain solution** is allowed to carry-over into the **heat set dryer**, provided that the dryer is vented into the afterburner. The VOC emissions from the use of fountain solutions (**E<sub>FOUNTAIN</sub>**) is calculated using the following equation:

$$E_{FOUNTAIN} = Q * VOC * [1 - (0.70 * C_{OVERALL})] \quad \text{Eq. (3)}$$

- ◆ 40% of emissions from **blanket/roller washes** is allowed to carry-over into the **heat set dryers only** for **automatic wash operations** provided that the dryer is vented into the afterburner. The VOC emissions from the use of blanket/roller washes (**E<sub>WASH</sub>**) is calculated using the following equation:

$$E_{WASH} = Q * VOC * [1 - (0.40 * C_{OVERALL})] \quad \text{Eq. (4)}$$

where:

- E<sub>FOUNTAIN</sub>** = Emissions of volatile organic compound (lbs)
- E<sub>WASH</sub>** = Volatile organic compound emission of blanket/roller washes (lbs)
- Q** = Quantity of material applied (lbs or gallons)
- VOC** = Organic compound content (lb/lb or lb/gal)
- C<sub>OVERALL</sub>** = Control System Overall Efficiency (decimal)

## **HOW TO REPORT**

- From the drop lists, select or provide **Material and Device Description, Material Code, and Activity Code.**
- **Annual Material Usage:** Enter total quantity of material used (Q) during the reporting period.
- **Units:** Select a unit from drop list – **pound or gallon**
- **Rule Number:** Enter **1171**
- **Application Numbers:** Enter applicable permit application number(s).
- **TAC / ODC:** Put check mark **ONLY IF** material contains TAC/ODC
- **Overall Control Efficiency:** Use equation (2) above to determine the Overall Control Efficiency and enter **in decimal** number. Enter zero (0.00) if Form B3U is used. Determine the applicable carry-over factor (0.70 for fountain solution and 0.40 for automatic blankets/rollers washes).
  - Final Overall Control Efficiency = Carry-Over factor \* C<sub>OVERALL</sub>
- **Emission Factor:** User can refer to the product Material Safety Data Sheet (MSDS) to determine the content of VOC. **NOTE:** Unit of VOC content must be consistent with that of material applied (Q), i.e., VOC in weight fraction or lb/lb for Q in pounds and VOC in lb/gal for Q in gallons.
- Enter the calculated overall control efficiency and emission factor and click “**ADD RECORDS**” to save your entries.